

**United States Patent**

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**Sekendur**

**December 22, 1998**

**Absolute optical position determination**

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***Parent Case Text***

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This application is a continuation-in-part of Ser. No. 07/862,977, filed Apr. 3, 1992 now U.S. Pat. No. 5,477,012.

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***Claims***

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I claim:

1. A coordinate sensor comprising:

a data surface formatted with at least one coding means for designating coordinates of at least one point on said data surface;

a detector means for detecting said at least one coding means and for generating at least one

*Sekendur*

December 22, 1998

output signal thereof;

a processing means for receiving and processing said at least one output signal, thereby to determine the position of said detector means relative to said data surface;

whereby said data surface comprises a writing surface.

2. A coordinate sensor according to claim 1, whereby:

said data surface comprises at least one dimension;

said at least one coding means comprises coordinates for at least one dimension;

said detector means comprises an array of light sensitive elements grouped together in at least one dimension.

3. A coordinate sensor according to claim 1, whereby:

said data surface comprises a substantially planar face;

said at least one coding means comprises coordinates for two dimensions for a plurality of points

***Sekendur***

**December 22, 1998**

on said data surface;

said detector means comprises an array of light sensitive elements grouped together in two dimensions.

4. A coordinate sensor according to claim 1, whereby:

said at least one coding means comprises an optical image;

said detector means comprises an array of light sensitive elements;

said processing means comprises a computer.

5. A coordinate sensor according to claim 1 selected from the group consisting of

said coordinate sensor whereby said coordinate sensor is designed for use with a computer,

said coordinate sensor whereby said coordinate sensor comprises a computer display,

said coordinate sensor whereby said coordinate sensor comprises a computer printer,

*Sekendur*

December 22, 1998

said coordinate sensor whereby said coordinate sensor comprises a computer,

said coordinate sensor whereby said processing means comprises a computer,

said coordinate sensor whereby said at least one coding means is printed on said data surface,

said coordinate sensor whereby said detector means comprises a writing means for writing on said data surface,

said coordinate sensor whereby said detector means comprises a writing means for writing on said data surface and further comprises an original hard copy means for forming an original hard copy made by said writing means on said data surface,

said coordinate sensor whereby said data surface is made of a material selected from the group consisting of paper, plastic, glass, metal, synthetic fiber, synthetic material, natural material, and a paper like substance,

said coordinate sensor whereby said at least one coding means comprises a reflecting means for reflecting said at least one coding means to said detector means,

said coordinate sensor whereby said detector means is selected from the group consisting of a

*Sekendur*

December 22, 1998

stylus shaped detector means for hand held use, and a hand held detector means suitable for hand held use,

said coordinate sensor whereby said data surface comprises an overlay means for overlaying a surface with said overlay means selected from the group consisting of carbon paper, film, template, and plate, whereby said carbon paper, film, template, and plate comprise said at least one coding means,

said coordinate sensor whereby said data surface comprises an overlay means for overlaying a surface with

said at least one coding means,

said coordinate sensor whereby said processing means uses the principle of interpolation to determine the

position of said detector means relative to said data surface,

said coordinate sensor whereby said processing means uses the principle of extrapolation to determine the position of said detector means relative to said data surface,

*Sekendur*

December 22, 1998

said coordinate sensor whereby said processing means uses the principle of triangulation to determine the position of said detector means relative to said data surface,

said coordinate sensor whereby said at least one coding means comprises a selective reflecting means for selectively reflecting at least one selected frequency of light, and

said coordinate sensor whereby said detector means comprises a selective detecting means for selectively detecting at least one selected frequency of light.

6. A coordinate sensor according to claim 1 comprising:

said at least one coding means, whereby said at least one coding means comprises coordinates for a plurality of points on said data surface;

a moveable element comprising said detector means, whereby said movable element is movable relative to said data surface;

means for determining the path of said moveable element by detecting a sequence of coordinates of said plurality of points in the path of said movable element.

7. A coordinate sensor according to claim 6, comprising means for analyzing the path of said

**United States Patent**

**5,852,434**

**Sekendur**

**December 22, 1998**

moveable element.

8. A coordinate sensor according to claim 1 whereby said detector means is selected from the group consisting of

an optical stylus comprising a rod shaped optical conduit body member including

a writing means for writing on said data surface and

a detecting means for detecting and outputting said at least one coding means;

an optical stylus comprising

a writing means for writing on said data surface and

a detecting means for detecting and outputting said at least one coding means; and

a self-contained optical stylus comprising

a writing means for writing on said data surface,

*Sekendur*

December 22, 1998

a detecting means for detecting and outputting said at least one coding means,

a microcomputer,

a user interface means for communicating with a user, and

a device interface means for communicating with other devices.

9. A coordinate sensor according to claim 1, whereby said at least one coding means comprises:

a plurality of dots systematically coded on said data surface;

each of the plurality of dots comprising three concentric circles partitioned into quadrants;

including a center circle,

an outer ring and an inner ring, whereby

the outer ring represents an X coordinate and the inner ring represents a Y coordinate;

each quadrant of the outer ring and the inner ring representing a digit of a four digit number and

*Sekendur*

December 22, 1998

further comprising four equal slices; whereby

the upper right quadrants of the outer ring and the inner ring represent the first digit of the

four digit number moving clockwise,

a combination of dark and light slices indicate an X-Y coordinate, and

the center circle optionally represents additional data.

10. A coordinate sensor comprising:

a data surface comprising a substantially two dimensional planar face formatted with at least one coding means for designating two dimensional coordinates of at least one point on said data surface;

a detector means comprising an array of light sensitive elements grouped together in two dimensions for detecting said at least one coding means, and an output means for generating at least one output signal thereof;

a processing means for receiving and processing said at least one output signal from said detector

*Sekendur*

December 22, 1998

means, thereby to determine the position of said detector means relative to said data surface;

whereby said data surface comprises a writing surface; and

whereby said at least one coding means comprises an optical image.

11. A coordinate sensor according to claim 10 selected from the group consisting of

said coordinate sensor whereby said coordinate sensor is designed for use with a computer,

said coordinate sensor whereby said coordinate sensor comprises a computer display,

said coordinate sensor whereby said coordinate sensor comprises a computer printer,

said coordinate sensor whereby said coordinate sensor comprises a computer,

said coordinate sensor whereby said coordinate means comprises a computer,

said coordinate sensor whereby said at least one coding means is printed on said data surface,

said coordinate sensor whereby said detector means comprises a writing means for writing on

*Sekendur*

December 22, 1998

said data surface,

said coordinate sensor whereby said detector means comprises a writing means for writing on said data surface and further comprises an original hard copy means for forming an original hard copy made by said writing means on said data surface,

said coordinate sensor whereby said data surface is made of a material selected from the group consisting of paper, plastic, glass, metal, synthetic fiber, synthetic material, natural material, and a paper like substance,

said coordinate sensor whereby said at least one coding means comprises a reflecting means for reflecting said at least one coding means to said detector means,

said coordinate sensor whereby said detector means is selected from the group consisting of a stylus shaped detector means for hand held use, and a hand held detector means suitable for hand held use,

said coordinate sensor whereby said data surface comprises an overlay means for overlaying a surface with said overlay means selected from the group consisting of carbon paper, film, template, and plate, whereby said carbon paper, film, template, and plate comprise said at least one coding means,

*Sekendor*

December 22, 1998

said coordinate sensor whereby said data surface comprises an overlay means for overlaying a surface with said at least one coding means,

said coordinate sensor whereby said processing means uses the principle of interpolation to determine the position of said detector means relative to said data surface,

said coordinate sensor whereby said processing means uses the principle of extrapolation to determine the position of said detector means relative to said data surface,

said coordinate sensor whereby said processing means uses the principle of triangulation to determine the position of said detector means relative to said data surface,

said coordinate sensor whereby said at least one coding means comprises a selective reflecting means for selectively reflecting at least one selected frequency of light, and

said coordinate sensor whereby said detector means comprises a selective detecting means for selectively detecting at least one selected frequency of light.

12. A coordinate sensor according to claim 10, comprising:

*Sekendur*

December 22, 1998

said at least one coding means, whereby said at least one coding means comprises coordinates for a plurality of points on said data surface;

a moveable element comprising said detector means, whereby said movable element is movable relative to said data surface;

means for determining the path of said moveable element by detecting a sequence of coordinates of said plurality of points in the path of said movable element.

13. A coordinate sensor according to claim 12 comprising means for analyzing the path of said moveable element.

14. A coordinate sensor according to claim 10, whereby said detector means is selected from the group consisting of

an optical stylus comprising a rod shaped optical conduit body member including

a writing means for writing on said data surface and

a detecting means for detecting and outputting said at least one coding means;

**United States Patent**

**5,852,434**

***Sekendur***

**December 22, 1998**

an optical stylus comprising

a writing means for writing on said data surface and

a detecting means for detecting and outputting said at least one coding means; and

a self-contained optical stylus comprising

a writing means for writing on said data surface,

a detecting means for detecting and outputting said at least one coding means,

a microcomputer,

a user interface means for communicating with a user, and

a device interface means for communicating with other devices.

15. A coordinate sensor according to claim 10, whereby said at least one coding means comprises:

*Sekendur*

December 22, 1998

a plurality of dots systematically coded on said data surface;

each of the plurality of dots comprising three concentric circles partitioned into quadrants;

including a center circle,

an outer ring and an inner ring, whereby

the outer ring represents an X coordinate and the inner ring represents a Y coordinate;

each quadrant of the outer ring and the inner ring representing a digit of a four digit number and further comprising four equal slices; whereby

the upper right quadrants of the outer ring and the inner ring represent the first digit of the

four digit number moving clockwise,

a combination of dark and light slices indicate an X-Y coordinate, and

the center circle optionally represents additional data.

United States Patent

5,852,434

*Sekendur*

December 22, 1998

16. An apparatus for obtaining and outputting the position and movement of a moveable element on a data surface comprising:

said data surface formatted with a position-related coding means for indicating X-Y coordinates,

an data input means for obtaining and outputting position-related data from said position-related coding means,

a data processing means for obtaining and analyzing position-related data from said data input means,

and a data output means for outputting analyzed position-related data.

whereby said data surface comprises a writing surface; and

whereby said at least one coding means comprises an optical image.

17. An apparatus for obtaining and outputting the position and movement of a moveable element on a data surface according to claim 16, selected from the group consisting of

said apparatus whereby said apparatus is designed for use with a computer,

*Sekendur*

December 22, 1998

said apparatus whereby said apparatus comprises a computer display,

said apparatus whereby said apparatus comprises a computer printer,

said apparatus whereby said apparatus comprises a computer,

said apparatus whereby said data processing means comprises a computer,

said apparatus whereby said position-related coding means is printed on said data surface,

said apparatus whereby said data input means comprises a writing means for writing on said data surface,

said apparatus whereby said data input means comprises a writing means for writing on said data surface and further comprises an original hard copy means for forming an original hard copy made by said writing means on said data surface,

said apparatus whereby said data surface is made of a material selected from the group consisting of paper, plastic, glass, metal, synthetic fiber, synthetic material, natural material, and a paper like substance,

*Sekendur*

December 22, 1998

said apparatus whereby said position-related coding means comprises a reflecting means for reflecting said position-related coding means to said data input means,

said apparatus whereby said data input means is selected from the group consisting of a stylus shaped data input means for hand held use, and a hand held data input means suitable for hand held use,

said apparatus whereby said data surface comprises an overlay means for overlaying a surface with said overlay means selected from the group consisting of carbon paper, film, template, and plate, whereby said carbon paper, film, template, and plate comprise said position-related coding means,

said apparatus whereby said data surface comprises an overlay means for overlaying a surface said position related coding means,

said apparatus whereby said data processing means uses the principle of interpolation to determine the position of said data input means relative to said data surface,

said apparatus whereby said data processing means uses the principle of extrapolation to determine the position of said data input means relative to said data surface,

*Sekendur*

December 22, 1998

said apparatus whereby said data processing means uses the principle of triangulation to determine the position of said data input means relative to said data surface,

said apparatus whereby said position-related coding means comprises a selective reflecting means for selectively reflecting at least one selected frequency of light, and

said apparatus whereby said data input means comprises a selective detecting means for selectively detecting at least one selected frequency of light.

18. An apparatus for obtaining and outputting the position and movement of a moveable element on a data surface according to claim 16, comprising:

said position-related coding means, whereby said position-related coding means comprises coordinates for a plurality of points on said data surface;

a moveable element comprising said data input means, whereby said movable element is movable relative to said data surface;

means for determining the path of said moveable element by detecting a sequence of coordinates of said plurality of points in the path of said movable element;

means for analyzing the path of said moveable element.

19. An apparatus for obtaining and outputting the position and movement of a moveable element on a data surface according to claim 16, whereby said data input means is selected from the group consisting of

an optical stylus comprising a rod shaped optical conduit body member including

a writing means for writing on said data surface and

a detecting means for detecting and outputting said position-related coding means;

an optical stylus comprising

a writing means for writing on said data surface and

a detecting means for detecting and outputting said position-related coding means; and

a self-contained optical stylus comprising

United States Patent

5,852,434

*Sekendur*

December 22, 1998

a writing means for writing on said data surface,

a detecting means for detecting and outputting said position-related coding means,

a microcomputer,

a user interface means for communicating with a user, and

a device interface means for communicating with other devices.

20. An apparatus for obtaining and outputting the position and movement of a moveable element on a data surface according to claim 16, whereby said position-related coding means comprises:

a plurality of dots systematically coded on said data surface;

each of the plurality of dots comprising three concentric circles partitioned into quadrants;

including a center circle,

an outer ring and an inner ring, whereby

***Sekendur***

**December 22, 1998**

the outer ring represents an X coordinate and the inner ring represents a Y coordinate;

each quadrant of the outer ring and the inner ring representing a digit of a four digit number and further comprising four equal slices; whereby

the upper right quadrants of the outer ring and the inner ring represent the first digit of the

four digit number moving clockwise,

a combination of dark and light slices indicate an X-Y coordinate, and

the center circle optionally represents additional data.

